

WHAT IS CLAIMED IS:

- 1 1. An adsorbent comprising:
2 a) 20-30 % porous carbon with incorporated organic
3 nitrogen species; and
4 b) 70-80% inorganic matter.
- 1 2. The adsorbent of claim 1, wherein the inorganic matter
2 includes highly dispersed catalytic oxides.
- 1 3. The adsorbent of claim 2, wherein the catalytic oxides are
2 one or more of copper oxide, zinc oxide, iron oxide, calcium oxide, silica and
3 alumina.
- 1 4. The adsorbent of claim 1, wherein the nitrogen species
2 comprises amine or pyridine groups.
- 1 5. The adsorbent of claim 1, wherein the surface area of the
2 adsorbent is 100-500 m²/g.
- 1 6. The adsorbent of claim 5, wherein the surface area of the
2 adsorbent is 100-200 m²/g.
- 1 7. The adsorbent of claim 1, wherein the adsorbent contains
2 micropores and the volume of the micropores are at least 0.03 cm³/g.

03097348-11661

1 8. The adsorbent of claim 1, wherein the pH of the adsorbent
2 is greater than 10.

1 9. The adsorbent of claim 1, wherein the pH of the adsorbent
2 is between 7 and 10.

1 10. The adsorbent of claim 1, wherein the pH of the adsorbent
2 is between 4 and 7.

1 11. A method of making an adsorbent which comprises:
2 a) thermally drying dewatered sewage sludge to form
3 granulated organic fertilizer; and
4 b) pyrolyzing said the organic fertilizer at temperatures
5 between 600 and 1000 °C.

1 12. The method of claim 11, wherein the heating rate is
2 between 5 and 10 °C/minute and the hold time is between 60 and 90 minutes.

1 13. The method of claim 11, wherein the temperature of
2 pyrolysis is between 800 and 1000 °C.

1 14. The method of claim 13, wherein the temperature of
2 pyrolysis is between 900 and 1000 °C.

1 15. The method of claim 11, wherein the temperature of
2 pyrolysis is between 600 and 900 °C and the adsorbent is further treated with 15-20 %
3 HCl.

2013-9-1

00997390.112904
105277.052550

1 16. The method of claim 15, wherein the temperature of
2 pyrolysis is between 800 and 900 °C.

1 17. An adsorbent formed by the method of claim 11.

1 18. The process of removing acidic gases from wet air streams
2 comprising putting an adsorbent comprising 20-30 % porous carbon with
3 incorporated organic nitrogen species and 70-80% inorganic matter in contact with
4 the wet air stream and allowing the adsorbent to adsorb the acidic gases.

1 19. The process of claim 18, wherein the acidic gases are one
2 or more of hydrogen sulfide, sulfur dioxide, hydrogen cyanide, and nitrogen dioxide.

1 20. The process of claim 18, wherein the acidic gas is hydrogen
2 sulfide which reacts with inorganic matter to be oxidized to sulfur dioxide or
3 elemental sulfur and salt forms thereof.

1 21. The process of claim 18, wherein the wet air stream is
2 effluent from a sewage treatment plant, gaseous fuel, or gases from hydrothermal
3 vents.

1 22. The process of removing acidic gases from wet air streams
2 comprising forming an adsorbent by thermally drying dewatered sewage sludge to
3 form granulated organic fertilizer and pyrolyzing said organic fertilizer at
4 temperatures between 600-1000 °C, putting said adsorbent in contact with the wet air
5 stream, and allowing the adsorbent to adsorb the acidic gases.

Subal

09937398112901

5/13/21

1 23. The process of claim 22, wherein the acidic gases are one
2 or more of hydrogen sulfide, sulfur dioxide, hydrogen cyanide, and nitrogen dioxide.

1 24. The process of claim 22, wherein the temperature of
2 pyrolysis is between 800 and 1000 °C.

1 25. The process of claim 24, wherein the temperature of
2 pyrolysis is between 900 and 1000 °C.

1 26. The process of claim 22, wherein the temperature of
2 pyrolysis is between 600 and 900 °C and the adsorbent is further treated with 15-20 %
3 HCl.

1 27. The process of claim 26, wherein the temperature of
2 pyrolysis is between 800 and 900 °C.

1 28. The process of claim 22, wherein the adsorbent may be
2 regenerated by heating to 300-500 °C to remove elemental sulfur and sulfur dioxide.